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**LOST IN SPACE:
HOW THE COST OF THE EU'S GALILEO PROJECT HAS SKYROCKETED**

Summary

- Leaked information from the European Commission and the German government has revealed a series of fresh delays and cost over-runs relating to the EU's controversial satellite navigation program, Galileo.
- According to this information, the deployment cost of the project is now estimated to be €1.5 billion to €1.7 billion above the previous estimates (from 2007), bringing the cost of deployment alone to between €4.9 and €5.1 billion. The revised estimates also include an annual subsidy of €750 million needed to fund Galileo's ongoing spending deficit once the project is up and running.
- Based on these new figures, we estimate the total cost of Galileo from start to completion, and then running it over a 20 year period, at a staggering €22.2 billion – a cost which will be borne entirely by taxpayers. Under the original estimates (from 2000) this cost would have been €7.7 billion, of which only €2.6 billion was to be borne by taxpayers and the rest by private investors.
- The UK's contribution towards the cost of completing and running the project for 20 years has gone from £385 million under the original estimates in 2000, to £2.95 billion, under the revised figures.
- The Galileo system aims to create an autonomous European equivalent to the American-run GPS, with more precise timing and location information for users. However, due to infighting and unrealistic expectations, the project has been haunted by delays and cost increases at almost every stage of its history. Originally it was to be finished by 2008 and chiefly financed by the private sector. But the private investors pulled out, citing a lack of commercial prospects. Consequently, Galileo became completely taxpayer-funded and has been delayed by almost decade.
- While Galileo will generate benefits if it's ever completed, it's far from clear how far-ranging these will be. In 2005 and 2006, the Commission estimated the market for Galileo to potentially consist of 3 billion receivers and revenues of some €275 billion per year by 2020 worldwide. However, with the Americans, Russians, Chinese, Indians and Japanese having either launched, or soon to launch, their own sat-nav systems, it's unlikely that the Galileo project will come anywhere near such market shares.
- The recent report from the German government admitted that "All in all, it is assumed, based on the currently available estimates, that the operating costs will exceed direct revenues, even in the long term."

The booming cost of Galileo

Phases	2000: Initial estimates from the Commission ⁱ	2007: Actual costs and estimates following the dissolving of the PPP ⁱⁱ	2010: European Commission/German government report ⁱⁱⁱ
Definition (€)	80,000,000	80,000,000	80,000,000
Development and validation (€)	1,100,000,000	2,100,000,000	2,100,000,000
Deployment (€)	2,150,000,000	3,400,000,000	5,000,000,000
Estimated cost from 1999 start until completion date (€)	3,330,000,000	5,580,000,000	7,180,000,000
Commercial operation p.a. (€)	220,000,000	312,000,000	750,000,000 [*]
20 years cost = 20xCost p.a. (€) [†]	4,400,000,000	6,240,000,000	15,000,000,000
Completion + 20 years operation, maintenance, etc. (€)	7,730,000,000 (of which 2.6bn from taxpayers)	11,820,000,000 (all from taxpayers)	22,180,000,000 (all from taxpayers)
Share contributed by the UK	17%	17% (14.5% from 2008 and onwards) [‡]	14.5%
Total estimated UK contribution; completion + 20 years of operation (€)	438,000,000	2,009,400,000	3,355,600,000
Total estimated UK contribution; completion + 20 years of operation (£) (euro>pound 1: 0.87976)	385,334,880	1,767,789,744	2,952,122,656

^{*} This is the estimated cost of funding the spending deficit of the Galileo project once up and running. It is not clear whether this cost also includes the annual operation cost of Galileo, i.e. maintenance, or if this cost will be in addition to deficit spending. The annual cost could therefore be an underestimate

[†] 20 years have previously been used as a baseline for estimating the annual operation cost of Galileo. In a 2008 House of Commons report, the then Transport Minister Rosie Winterton stated that “£5.5 billion is an operating estimate cost over 20 years”, which would give an estimated £275 million per year. For our 2008 estimate of the annual cost, however, we have used figures from a 2009 European Court of Auditors report, which put the annual cost for operation, maintenance and replenishment debt interest until 2030 at €5.3 billion. See, <http://www.publications.parliament.uk/pa/cm200708/cmselect/cmtran/53/53.pdf>, Q13.

[‡] Up until 2008, the UK’s share of the project was 17%, as specified in the 2008 House of Commons report. However, from 2008 and onwards, we have used the UK’s gross share in the EU budget – on average roughly 14.5% between 2008 and 2011 – since the project was from then on financed completely by the EU budget. As the UK’s rebate is being phased out, this share could turn out to be an underestimate for the UK’s future share. We have used the 17% share for the original development and deployment cost, and the 14.5% share for the €1.5-€1.7 billion added to the cost of deployment, according to the most recent estimates. We have also taken €1.6 billion as central estimate.

Reasons for the increased costs: infighting, delays and mismanagement

In 2009 the European Court of Auditors found that the Galileo project suffered from poor organisation and management, and was haunted by bickering and contradictory interests among member states. This, in turn, has consistently pushed up the costs. Reasons for cost increases and delays have included:

- Following EU investment and European Space Agency funding and research during the initial years, 2/3 of the funding was from 2005 and onwards meant to come from private investors, with the rest financed through public funds.
- However, infighting amongst some European countries about the contract details, spending questions and disagreement over technical details led to severe delays.^{iv} For example, member states fought over where the system's activity centre, ground infrastructure and headquarters would be located. Meanwhile, the consortium of private investors argued about which company would bid for the concession contract.^v
- Between July 2005 and December 2005, the project came to a complete halt as member states and the private investors continued to argue amongst themselves and couldn't agree on how to move forward. According to the European Court of Auditors, these six months of doing absolutely nothing added an extra €103 million to the cost of the project.^{vi}
- Much of 2006 was further dominated by disagreements.^{vii} Eventually in 2007 the Commission set a deadline by which private investors had to make a decision on how to proceed and how much to invest. With this, the consortium collapsed, as the private investors feared that costs of Galileo would "spiral out of control" and didn't outweigh the benefits.^{viii} The Court of Auditors concluded that the original public-private partnership proposal was "unrealistic" and "inadequately prepared and conceived."
- With the absence of private financing, questions about the relevance of the project and bickering led to further delays and discontent.^{ix} Following heated discussions, in May 2007 it was decided that the EU would redirect the program, postpone its deployment until 2013 and wholly fund it from the EU budget.
- In 2003, China agreed to invest €230m in the project but pulled out after disagreements and security concerns related to its primary interest in the security-oriented portion of the service.^x While Galileo was falling behind schedule, the Chinese were developing their system, Compass/Beidou. Chinese officials have told the International Telecommunications Union, the United Nations agency that allocates radio spectrum frequencies for satellite use, that China plans to transmit signals on the wavelength that the EU wants to use for Galileo, meaning that Europe would be unable to use the wavelength unless it received China's permission.

In evidence given to the House of Lords EU Committee in April 2009, Dr Nicola Casarini, Marie Curie Research Fellow in the Robert Schuman Centre for Advanced Studies at the European University Institute Florence, said:

"The Agreement included details regarding the amount of money that the Chinese government would invest in Galileo (€70 million at that time) with the provision that these sums will remain inside the country and serve to build the

Chinese infrastructure, components, and services for the satellite navigation system. Moreover, the Agreement contained clear indication that the rights of the technology developed while working on Galileo would remain the property of the National Remote Sensing Centre of China.^{xix}

She added, “Cooperation in the Galileo project is assisting China in fostering the development of its own, independent satellite navigation system.”

- Even ten years after its launch, the Court of Auditors noted that Galileo had still not factored in any kind of contingency budget or reserve. Other international space organisations typically need a contingency budget of 15-40%.
- The Court of Auditors also found that basic security requirements had not been considered. As a consequence, close to 1000 changes had to be made throughout the project as this oversight emerged. These changes had a huge impact on the technical baseline and ongoing activities, increasing the cost of the project by €120 million.^{xii}
- A Galileo Control Centre was built in Oberpfaffenhofen, Germany, costing over €100m, but because of the constant delays to the actual Galileo project, it was completed almost a decade before it will be used.^{xiii}
- Private funding wasn't found until 2004/05 - 29 months later than planned. This led to severe delays to the second (development and validation) phase – the delays itself added an extra €142 million in costs to the project. As described above, this funding was subsequently withdrawn.^{xiv}

Current costs and state of play

Following the collapse of the Private-Public Partnership in 2007, Galileo became a joint initiative of the European Space Agency and the European Commission. The project is fully funded by the EU budget with the ESA acting as design and procurement agent on behalf of the Commission.^{xv}

Whilst a few small satellites have now been deployed, the initial aspiration of the Galileo project being completely up and running by 2008 now appear to have been a completely unrealistic goal all along. In 2007, the Commission said that it expected Galileo to be up and running by 2013 – but this deployment date has now been delayed yet again, this time until 2017/2018.

As the project has faced delays, EU taxpayers' contributions towards the project have skyrocketed. The deployment cost of the project is now estimated to be €1.5 billion to €1.7 billion above the previous estimates (from 2007), bringing the cost of deployment to between €4.9 and €5.1 billion. The revised estimates also include an annual subsidy of €750 million needed to fund the project's ongoing deficit for an unspecified number of years (see table above).

Although this information still isn't public and is difficult to verify – which in itself is hugely problematic given the implication for taxpayers – it's still vitally important to try to assess what the new estimates mean for the costs and value-added of the project.

Based on the leaked figures we estimate the total cost of completing Galileo and running it over a 20 years period at a staggering €22.2 billion – a cost which will be

borne entirely by taxpayers. This is a huge increase from the original €2.6 billion which European taxpayers were asked to put in under the original PPP deal.

Meanwhile, the cost to the UK of completing and running the project for 20 years has gone from £385 million under the Commission's original estimates in 2000 – but we now estimate them at almost £2.95 billion.

In 2007, EU member states committed to the €3.4 billion – an amount which then was thought to be sufficient to complete the deployment phase of the project. However, according to an Impact Assessment from the Commission from June, only €38 million now remains available until 2013.^{xvi}

It's not yet decided where the extra €1.5-€1.7 billion in deployment costs and funds to cover the €750 million in running cost will come from. It's likely that calls for channelling more money towards the project within the EU budget will be resisted by several member states, including the UK. However, allocation of these funds will be taken by Qualified Majority Voting (QMV) meaning that no member state has a veto.

Will Galileo generate the estimated benefits?

In 2005 and 2006, the Commission estimated the market for Galileo as potentially consisting of 3 billion receivers and revenues of some €275 billion per year by 2020 worldwide – in addition to potentially leading to the creation of more than 150,000 high qualified jobs in Europe alone.^{xvii}

In 2007 – when the project had only launched the first demonstrator spacecraft and no satellites – a document issued by various organisations, including the European Space Agency, optimistically estimated that Galileo would have 1.8 billion users by 2010 and 3.6 billion users by 2020.^{xviii}

While there's no doubt that the project will generate benefits if it's ever completed, these estimates were always completely unrealistic. Indeed, a recent report from the German government admitted that "All in all, it is assumed, based on the currently available estimates, that the operating costs will exceed direct revenues, even in the long term."^{xix}

With many people worldwide used to the free-of-charge GPS system the question is who will actually be willing to pay for Galileo. As Galileo keeps on facing delays, it also loses much of its relative value. This is because the sat-nav market is becoming increasingly crowded, as more actors enter the game and the existing competitors develop their technologies further.

The Commons Transport committee noted already in 2008 (in regards to the 2013 delay):

“Clearly, the five-year delay that is now expected has implications for the benefits and value for money of the Galileo programme. Five years is a very long time in a fast moving industry, and the landscape for GNSS will undoubtedly be quite different in 2013 as compared to 2008, the completion date for Galileo originally anticipated. And it is not only GPS that is changing. Other countries are also entering the market with global or regional systems.”^{xx}

The newly-redeveloped Russian “GLONASS” system has already been launched, and the Chinese have utilised information garnered from their initial involvement with Galileo and have moved on to set up their own hi-tech satellite navigation system. The Chinese “Beidou” system, whilst not a global endeavour, will provide sufficient coverage for national users and seems set to deprive Galileo of revenue in China.^{xxi} India will launch its equivalent technology, IRNSS, by 2014 and Japan is also planning its own regional system. With the US (soon to boast a third-generation GPS system), Chinese, Russian, Indian and Japanese markets already crowded, Galileo would struggle to reach its 3 billion user target.

It’s true that UK-based companies have been awarded contracts to build satellites and other parts for the Galileo project – according to some sources worth up to €1 billion – so it’s clear that the UK economy has stood to benefit. However, if the most recent estimates are accurate, this is arguably outweighed by UK government investment of €3.1 billion over 20 years.^{xxii}

The initial plan for Galileo

Galileo was seen in its earliest days as paving the way towards technological independence from the US’s rival GPS satellite navigation. The American government is open about their prioritisation of GPS for US military and security purposes; global signals are weakened if resources are needed by the Pentagon.^{xxiii} Galileo was considered as a proclamation of independent European capability and a removal of the US’s monopoly over global information transfer.^{xxivxxv} Some EU leaders have also said they want to use Galileo for defence purposes – which has been a point of contention amongst EU member states.

Additionally it was to be more sophisticated than its American counterpart, offering five valuable services^{xxvi}:

- Open Access Navigation: This was to be 'free to air' and available to the masses; Simple timing and positioning accurate to 1m
- Commercial Navigation: High accuracy to a cm scale; Encrypted and high-quality service for which providers will charge
- Safety of Life Navigation: When precise accuracy is necessary; Messages will warn of errors; Open service
- Public Regulated Navigation: Government agencies would be main users; continuous availability even in time of crisis and encryption for higher security
- Search and Rescue: System will receive information of people in distress; feedback can be sent, confirming help is coming

These high-quality services, and indeed the project as a whole, were initially deemed economically viable only under the private-public funding model.^{xxvii} As noted above, 1/3 would come from taxpayers and the rest from private investment, but these plans were scrapped when the private investors pulled out.^{xxviii}

What’s the best way forward?

In a 2008 Commons report, MPs called the Galileo project “a textbook example of how not to run large-scale infrastructure projects.”^{xxix} Gwyneth Dunwoody, Chairwoman of the Transport Select Committee, noted:

“The Commission is poised to spend billions of taxpayers’ money on a satellite system without any realistic assessment of its costs and its benefits.

To fund this, it is prepared to break all the rules for prudent budgetary discipline.^{xxx}

This is all the more true in today's economic climate. At a time of austerity, the uncertainty surrounding the final cost of the project and its launch date is completely unacceptable.

Moving forward, the UK government needs to seek to block any further attempts at channelling more money towards Galileo, until it's clear that the benefits of the project outweigh the cost in the long-term. Therefore, Galileo now needs to be subject to a final cost-benefit analysis – conducted by an independent, non-politicised body (so not the Commission) and based on the realistic, commercial parameters of the project.

If the analysis shows that as a consequence of the massive cost over-run and the delays, Galileo no longer offers value for money, it should be dropped – and the UK government must not shy away from arguing in favour of doing so. The technology harnessed from Galileo should in that case be put to good use elsewhere. Alternatively, a smaller-scale project could be pursued, with fewer satellites and a less ambitious scope.

The Commission has in the past asked for more money for Galileo under QMV, meaning that individual member states haven't had a veto. Given that the final bill for European taxpayers of completing and running the project over 20 years is now estimated at almost £20 billion more than the original estimates, any decisions to channel more money towards Galileo must be taken by unanimity in the European Council.^{xxxi}

**Break-down of costs to the UK of developing, launching and running Galileo:
original vs. most recent estimates**

<i>Most recent estimates (2010)</i>	<i>Euros</i>	<i>Pounds</i>
Deployment only	810,000,000	712,605,600
Development + deployment cost, up until 2008	948,600,000	834,540,336
Additional cost of deployment according to recent cost revisions	224,000,000	197,066,240
Total deployment +development cost	1,180,600,000	1,038,644,656
Running cost	108,750,000	95,673,900
Running cost over 20 yrs	2,175,000,000	1,913,478,000
Total, development+running cost, 20 yrs	3,355,600,000	2,952,122,656

<i>Original estimates (2000)</i>	<i>Euros</i>	<i>Pounds</i>
Deployment only	121,833,212	107,183,986
Development + deployment cost	188,699,811	166,010,546
Running cost	12,466,654	10,967,664
Running cost over 20 yrs	42,386,624	37,290,057
Total, development+running costs, 20 yrs	438,000,000	385,334,880

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- ⁱ Cited in European Court of Auditors, The Management of the Galileo Programme's Development and Validation Phase, special report No 7, Table 2
<http://eca.europa.eu/portal/pls/portal/docs/1/2760294.PDF>.
- ⁱⁱ Cited in European Court of Auditors, The Management of the Galileo Programme's Development and Validation Phase, special report No 7, Table 2
<http://eca.europa.eu/portal/pls/portal/docs/1/2760294.PDF>.
- ⁱⁱⁱ The actual documents are still not available to the public, including the Commission's impact assessment on its proposal dated 8 October 2010. But leaked information has been reported in Cited in *Der Spiegel*, "EU Expects Galileo Project Costs to Explode", 7 October 2010, see <http://www.spiegel.de/international/europe/0,1518,721761,00.html> and FT Deutschland "Galileo-Projekt wird zum Milliardengrab", 6 October, 2010, <http://www.ftd.de/unternehmen/industrie/navigationssatellit-galileo-projekt-wird-zum-milliardengrab/50179534.html>. See also http://ec.europa.eu/enterprise/policies/satnav/galileo/files/prs-proposal-com-2010-550-final_en.pdf
- ^{iv} <http://www.spiegel.de/international/europe/0,1518,528441,00.html>
- ^v European Court of Auditors, The Management of the Galileo Programme's Development and Validation Phase, special report No 7, Table 2
<http://eca.europa.eu/portal/pls/portal/docs/1/2760294.PDF>.
- ^{vi} Ibid.
- ^{vii} Cited in <http://news.bbc.co.uk/1/hi/sci/tech/6450367.stm>
- ^{viii} <http://www.spiegel.de/international/europe/0,1518,721761,00.html>
- ^{ix} European Court of Auditors, The Management of the Galileo Programme's Development and Validation Phase, special report No 7, Table 2
<http://eca.europa.eu/portal/pls/portal/docs/1/2760294.PDF>.
- ^x See <http://news.bbc.co.uk/1/hi/business/3121682.stm> and <http://query.nytimes.com/gst/fullpage.html?res=9503E1DF153BF930A15750C0A96F9C8B63&sec=&pgewanted=all>
- ^{xi} Cited in <http://www.publications.parliament.uk/pa/ld200910/ldselect/ldcom/76/76we03.htm>
- ^{xii} Ibid.
- ^{xiii} http://www.dlr.de/en/desktopdefault.aspx/tabid-1/86_read-13448/
- ^{xiv} Ibid
- ^{xv} The ESA still features these estimates on its website, see http://www.esa.int/esaNA/GGGMN850NDC_galileo_0.html
- ^{xvi} See http://ec.europa.eu/governance/impact/ia_carried_out/docs/ia_2010/sec_2010_0717_en.pdf
- ^{xvii} The Commission repeated these figures in several press releases and documents throughout 2005 and 2006, see for example <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/23> , <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/05/666&format=HTML&aged=1&language=EN> and <http://www.galileoic.org/la/files/GIC%20Inaguration%20-%20EGNOS%20Galileo.pdf>
- ^{xviii} <http://www.sophia-antipolis.org/fsa/animation/culture-scientifique-technique/2007/20-04-2007/information4participants.pdf>
- ^{xix} Cited in *Der Spiegel*, "EU Expects Galileo Project Costs to Explode", 7 October 2010, see <http://www.spiegel.de/international/europe/0,1518,721761,00.html>
- ^{xx} <http://www.publications.parliament.uk/pa/cm200708/cmselect/cmtran/53/53.pdf>
- ^{xxi} <http://www.spiegel.de/international/europe/0,1518,528441,00.html>
- ^{xxii} See for example, <http://news.bbc.co.uk/1/hi/8442090.stm>
- ^{xxiii} <http://www.ftd.de/unternehmen/industrie/navigationssatellit-galileo-projekt-wird-zum-milliardengrab/50179534.html>
- ^{xxiv} <http://news.bbc.co.uk/1/hi/sci/tech/4555276.stm>
- ^{xxv} European Court of Auditors, The Management of the Galileo Programme's Development and Validation Phase, special report No 7, Table 2
<http://eca.europa.eu/portal/pls/portal/docs/1/2760294.PDF>.
- ^{xxvi} <http://news.bbc.co.uk/1/hi/8442090.stm>
- ^{xxvii} European Court of Auditors, The Management of the Galileo Programme's Development and Validation Phase, special report No 7, Table 2
<http://eca.europa.eu/portal/pls/portal/docs/1/2760294.PDF>.
- ^{xxviii} Ibid
- ^{xxix} <http://news.bbc.co.uk/1/hi/sci/tech/4555276.stm>
- ^{xxx} <http://www.independent.co.uk/news/business/news/galileo-an-orbiting-railtrack-say-mps-400046.html>
- ^{xxxi} Any budget increase or reshuffle which totals more than 0.03% of EU GNI would trigger unanimity decision-making in Council under the EU Treaties.